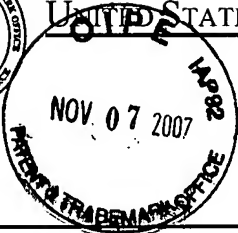




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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/522,618

01/31/2005

Tadayuki Kameyama

052009

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38834 7590 11/02/2007
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EXAMINER

EMPIE, NATHAN H

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

11/02/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/522,618

Applicant(s)

KAMEYAMA ET AL.

Examiner

Nathan H. Empie

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-30 is/are pending in the application.
- 4a) Of the above claim(s) 19-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 1/31/05, 4/4/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION***Election/Restrictions***

Applicant's election with traverse of Group I, claims 1 and 3-18, in the reply filed on 9/19/07 is acknowledged. The traversal is on the ground(s) that the applied reference: Ikemoto et al. (JP 10153709 A; hereafter Ikemoto) fails to disclose a length of time up to when the film is brought into contact with a first guide roll in the swelling bath is reduced. This is not found persuasive, as Ikemoto teaches that this process of forming a polarization film is significantly concerned with the prevention of wrinkle formation, noting that when a PVA resin film swells too much, wrinkles occur, and that if an unstable film traverses through a series of zigzagging guide rollers such wrinkles can be worsened [0008][0033]. Ikemoto also teaches the general conditions of result effective variables such as the length of time the film is submerged in the swelling bath (abstract, [0030-0033]). Ikemoto doesn't explicitly teach the polymer film is brought into contact with the first submerged guide roll within a time up to when swelling reaches a saturation state and further is brought into contact with the second guide roll after the swelling reaches the saturation state. But, as Ikemoto teaches a method of obtaining wrinkle free polarization films, while describing general problems involved with swelling and the transport of swelled films, as well a range of film submergence time; it would have been obvious to one of ordinary skill in the art to alter a length of time up to when the submerged film is brought into contact with a first and second submerged guide rolls based on the amount of swelling in the polymer film, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

The requirement is still deemed proper and is therefore made FINAL.

Claims 19-30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 09/19/2007.

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Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 12 recites the limitation "the guide roll", but within claim 1 from which claim 12 depends, "at least" a "first guide roll", and a "second guide roll" are mentioned, so as claim 12 is currently written it is unclear as to which guide roll (first, second, or further) "the guide roll" is in reference to. For purposes of examination "the guide roll" will be interpreted as any guide roll. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-8, 10, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto et al (JP 10153709A; hereafter Ikemoto).

Claims 1, 3-7, 10, 17: Ikemoto teaches a method of producing a polarizing film (Abstract and [0014 – 0020]), comprising the steps of: allowing a hydrophilic polymer film (PVA based film) to swell wherein the polymer film is conveyed by means of a guide roll (guide rolls pictured as small circles in Fig 1) so as to be impregnated in an aqueous solvent (water and boric acid) in a swelling bath (swelling tank, (10)) (Fig 1, and [0008], [0016]);

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dyeing the polymer film using a dichroic substance (film passes through a dyeing tank (12) containing an iodine solution; Fig 1, and [0017]);

and stretching the polymer film (stretching tub (14); Fig 1, [0018]);

wherein in the swelling step, at least a first guide roll and a second guide roll are arranged in the swelling bath (Fig 1), and when the polymer film is impregnated in and allowed to travel in the aqueous solvent (Fig 1, [0008], [0016]),

Ikemoto further teaches that this process of forming a polarization film is significantly concerned with the prevention of wrinkle formation, noting that when a PVA resin film swells too much, wrinkles occur, and that if an unstable film traverses through a series of zigzagging guide rollers such wrinkles can be worsened [0008][0033]. Ikemoto also teaches the general conditions of result effective variables such as the length of time the film is submerged in the swelling bath (abstract, [0030-0033]). Ikemoto doesn't explicitly teach the polymer film is brought into contact with the first submerged guide roll within a time up to when swelling reaches a saturation state and further is brought into contact with the second guide roll after the swelling reaches the saturation state or the specific time conditions of claims 3-5 or 7. But, as Ikemoto teaches a method of obtaining wrinkle free polarization films, while describing general problems involved with swelling and the transport of swelled films, as well a range of film submergence time; it would have been obvious to one of ordinary skill in the art to alter a length of time up to when the submerged film is brought into contact with a first and second submerged guide rolls based on the amount of swelling in the polymer film, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claim 8: Ikemoto further teaches the polymer film is impregnated in the swelling bath for a time in the range of 4 to 6 minutes (abstract, [0011]).

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Claim 14: Ikemoto further teaches the temperature of the swelling bath lies in the range of 30 – 40°C (abstract, [0011]).

Claim 15: Ikemoto teaches that the polymeric film swells in the swelling bath, as well as being pulled along guide rollers, so inherently when the film material swells it is stretched.

Claim 16: Ikemoto teaches the method of claim 1 (described above), but does not explicitly teach wherein with respect to a length of the polymer film before being subjected to the swelling step, a stretch ratio of the polymer film in the stretching treatment is in a range of 1.5 to 4.0 times. A “stretch ratio” as described by applicants disclosure (pg 13 lines 9 – 30) would appear to be dependant upon the time the polymeric film is submerged in the swelling bath, as described in the rejection to claim 1 (above), the submerging time is a result effective variable, therefore it would have been obvious to one of ordinary skill in the art to alter a length of submerging time, correspondingly altering the “stretch ratio”, to achieve a range of 1.5 to 4.0 times, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto as applied to claim 1 above, and further in view of Sanefuji et al (US 2002/0001700 A1).

Ikemoto teaches the method according to claim 1, and further teaches that the final thickness, following drying, of the PVA film produced from the polarizing film process is about 20 – 35 microns ([0020]). Ikemoto is silent as the starting PVA film thickness, therefore Ikemoto does not explicitly teach the PVA film before being subjected to a swelling treatment has a thickness in a range of not more than 110 micron. Sanefuji teaches that the typical thickness range of a PVA film (pre-swelling) is preferably between 40 to 120 microns, as when the average thickness is less than 20 micron, stretching break occurs, and when the average thickness is over 150 microns stretching irregularity occurs in monoaxial stretching

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in producing a polarization film ([0027]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have selected a pre-swollen PVA film thickness of between 40 to 120 microns, as taught by Sanefuji, for the PVA film thickness in the polarization process taught by Ikemoto as Ikemoto is silent, and values outside of this taught range would lead to breaking or irregular stretching of the polarization film. Although Ikemoto in view of Sanefuji doesn't specifically teach the PVA film before being subjected to a swelling treatment has a thickness in a range of not more than 110 micron, it would have been obvious to one of ordinary skill in the art at the time of invention to have selected a thickness range of not more than 110 microns, since in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto as applied to claim 1 above, and further in view of Harita et al (US 2001/0024322 A1; hereafter Harita). Ikemoto teaches the method according to claim 1, wherein the hydrophilic polymer film is a PVA based film ([0007]), but is silent as to specific chemistries of the PVA film. Harita teaches producing a polarization film from a PVA based film via processes including stretching, dyeing, fixing, etc. (abstract, [0049]). Harita specifically teaches adding 10 parts by weight of glycerin to 100 parts by weight of a PVA preparation solution (~9 wt %) ([0062]). Harita further teaches that when producing the PVA film it is advantageous to incorporate plasticizer such as glycerin as it is suitably used for improving the PVA films stretchability ([0034-0035]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated ~9 wt % of glycerin into a PVA polymer film, as taught by Harita, in the process taught by Ikemoto as the addition would improve the stretchability of the PVA based film.

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Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto as applied to claim 1 above, and further in view of Burger (US patent 3,492,185; hereafter Burger).

Ikemoto teaches the method of claim 1 (described above), but is silent as to what type of guide rolls are used in the process. Using bent roll as guide rolls is well known in the art as evidenced by Burger (col 6 lines 45 – 51). Burger further teaches that a bent roll can aid the reduction of longitudinal wrinkles in a web product (col 6 lines 45 – 51). Ikemoto teaches that the purpose of their invention is to obtain wrinkle free polarization sheets ([0008], [0011]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected specific types of guide rolls, such as a bent roll, for any guide roll(s) of the method taught by Ikemoto, for the purpose of reducing longitudinal wrinkles in the film.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto as applied to claim 1 above, and further in view of Kondo (JP 2000-147252; hereafter Kondo).

Ikemoto teaches the method of claim 1 (described above), but is silent as to what type of guide rolls are used in the process. Kondo teaches a method for producing a polarization film, where the hydrophilic polymer film is contacted by rubber spiral guide rolls, arranged as 1 or 2 or more of the guide rolls, arranged besides or within a bath liquid (Fig 1, [0014-0016]). Additionally Kondo teaches that the motivation for using spiral rubber covered rolls is that they prevent the generation of fractures, and blemishes to the film [0004]). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a spiral roll as a guide roll, as taught by Kondo, for a guide roll other than the first guide roll in the process taught by Ikemoto as the incorporation of multiple spiral rolls will lead to lower occurrence of film fracture and blemishes.

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Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikemoto as applied to claim 17 above, and further in view of Tanaka et al (US patent 5,071,906; hereafter Tanaka).

Ikemoto teaches the method of claim 17 (described above), where the dichroic solution is an iodine solution ([0017]), but Ikemoto does not explicitly teach the iodine solution contains at least two organic dyestuffs. Tanaka teaches a method of producing polarizing films where the addition of a dichroic dye solution is applied to a PVA film (col 5 line 55 – col 6 line 16). Further Tanaka teaches that iodine and dichroic dyes (plural) may be used together in order to control the hue (col 6 lines 10 – 13). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have added a plurality of dichroic dyes, as taught by Tanaka, to the iodine solution taught by Ikemoto in order to control the hue of the dye solution.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan H. Empie whose telephone number is (571) 270-1886. The examiner can normally be reached on M-F, 7:00- 4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

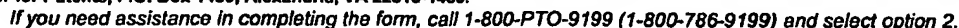
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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NHE

NHE

Katherine R. Ford
KATHERINE R. FORD
PRIMARY EXAMINER



10/522618

DT05 Rec'd PCT/PTO 31 JAN 2006

INFORMATION DISCLOSURE STATEMENT PTO-1449	Atty. Docket No. 052009.	Serial No. New Appln. 10/522618
	Applicant(s): Tadayuki KAMEYAMA et al.	
	Filing Date: January 31, 2005	Group Art Unit: 1792

U.S. PATENT DOCUMENTS

Examiner Initial	Document No.	Name	Date	Class	Subclass	Filing Date (If appropriate)

FOREIGN PATENT DOCUMENTS

	Document No.	Date	Country	Translation (Yes or No)	
/N.E./	AA	JP10-153709	06/09/98	Japan	Abstract. Cited in the int'l. search report.

OTHER DOCUMENTS

Examiner	/Nathan Empie/	Date Considered 10/30/2007

Notice of References Cited	Application/Control No. 10/522,618	Applicant(s)/Patent Under Reexamination KAMEYAMA ET AL.	
	Examiner Nathan H. Empie	Art Unit 1792	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,492,185	01-1970	BURGER WILLIAM H	156/425
*	B	US-5,071,906	12-1991	Tanaka et al.	524/557
*	C	US-2001/0024322	09-2001	Harita et al.	359/490
*	D	US-2002/0001700	01-2002	Sanefuji et al.	428/220
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	JP 10153709 A	06-1998	Japan	IKEMOTO et al.	
	O	JP 2000147252 A	05-2000	Japan	KONDO et al.	
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

(19) 日本国特許庁 (J P)

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G 0 2 B 5/30

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Fターム (参考) 2H049 BA02 BA26 BA27 BB22 BB43
BC03

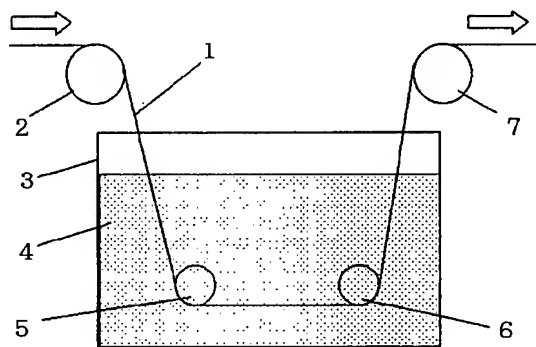
(54) 【発明の名称】 偏光フィルムの製造方法及び偏光板

(57) 【要約】

【課題】 搬送の親水性高分子フィルムに皺や折れ曲がりが発生しにくいスパイラルゴムロールの利点を活かしつつ、破断や押し跡傷等の発生を予防して湿式法の適用が可能な偏光フィルムの製造方法の開発。

【解決手段】 浴外及び浴液内に配置した複数のガイドロール (2, 5, 6, 7) を介し、親水性高分子フィルム (1) に二色性物質を含浸させて浴液 (4) 内を浸漬搬送しつつ延伸処理して偏光フィルムを製造するにあたり、前記ガイドロールの少なくとも1本に、中央部を基準に左右対称なスパイラル溝を有し、かつゴム硬度が100以下のスパイラルゴムロールを用いる偏光フィルムの製造方法、及びその偏光フィルムの片側又は両側に透明保護層を設けてなる偏光板。

【効果】 膨潤した親水性高分子フィルムに破断等が発生しにくくて湿式法を良好に適用でき、スパイラル効果で皺等の発生も防止できて品質の良好な偏光フィルムを歩留まりよく効率的に製造できる。



【特許請求の範囲】

【請求項1】 浴外及び浴液内に配置した複数のガイドロールを介し、親水性高分子フィルムに二色性物質を含浸させて浴液内を浸漬搬送しつつ延伸処理して偏光フィルムを製造するにあたり、前記ガイドロールの少なくとも1本に、中央部を基準に左右対称なスパイラル溝を有し、かつゴム硬度が100以下のスパイラルゴムロールを用いることを特徴とする偏光フィルムの製造方法。

【請求項2】 請求項1において、スパイラルゴムロールがそのスパイラル溝の親水性高分子フィルムと接する部分を1mm以上の曲率半径を有する状態に成形した溝幅50mm以下のものである製造方法。

【請求項3】 請求項1又は2において、スパイラルゴムロールをゴム硬度又はスパイラル溝の形状が相違する組合せにて2本以上用いる製造方法。

【請求項4】 請求項1～3において、スパイラルゴムロールを浴液内に配置する製造方法。

【請求項5】 請求項1～4に記載の方法により製造してなる偏光フィルムの片側又は両側に透明保護層を設けてなることを特徴とする偏光板。

【発明の詳細な説明】

【0001】

【発明の技術分野】 本発明は、湿式方式により品質の安定した偏光フィルムを効率よく製造しうる方法及びその偏光フィルムを用いた偏光板に関する。

【0002】

【発明の背景】 従来、図1に例示したように、浴3の内外に配置した複数のガイドロール2、5、6、7を介し矢印の如く、親水性高分子フィルム1に二色性物質を含浸させて浴液4内を浸漬搬送しつつ延伸処理する湿式法にて偏光フィルムを製造する方法としては、ガイドロールとして表面が可及的に滑らかなものを用いる方法が知られていた。

【0003】 しかしながら、浴液内を浸漬搬送する際の膨潤で親水性高分子フィルムに皺や折れ曲がりが発生しやすい問題点があった。その皺取り等を目的に表面にスパイラル溝を形成した従来のスパイラルゴムロールを用いた場合には、膨潤により強度低下した親水性高分子フィルムが破断して湿式法を適用できなかつたり、得られる偏光フィルムにゴムロールの押し跡等の傷が多数残存してやはり湿式法の適用が実質的に困難であった。

【0004】

【発明の技術的課題】 本発明は、搬送の親水性高分子フィルムに皺や折れ曲がりが発生しにくいスパイラルゴムロールの利点を活かしつつ、破断や押し跡傷等の発生を予防して湿式法の適用が可能な偏光フィルムの製造方法の開発を課題とする。

【0005】

【課題の解決手段】 本発明は、浴外及び浴液内に配置した複数のガイドロールを介し、親水性高分子フィルムに

二色性物質を含浸させて浴液内を浸漬搬送しつつ延伸処理して偏光フィルムを製造するにあたり、前記ガイドロールの少なくとも1本に、中央部を基準に左右対称なスパイラル溝を有し、かつゴム硬度が100以下のスパイラルゴムロールを用いることを特徴とする偏光フィルムの製造方法、及びその偏光フィルムの片側又は両側に透明保護層を設けてなることを特徴とする偏光板を提供するものである。

【0006】

【発明の効果】 本発明によれば、上記特長のスパイラルゴムロールを用いたことにより、それを介し浴液内を浸漬搬送した場合にも、膨潤した親水性高分子フィルムに破断や押し跡傷等が発生しにくくて湿式法を良好に適用でき、かつスパイラル効果で皺や折れ曲がり等の発生も防止できて品質の良好な偏光フィルムを歩留まりよく効率的に製造することができる。

【0007】

【発明の実施の形態】 本発明による製造方法は、浴外及び浴液内に配置した複数のガイドロールを介し、親水性高分子フィルムに二色性物質を含浸させて浴液内を浸漬搬送しつつ延伸処理して偏光フィルムを製造するにあたり、前記ガイドロールの少なくとも1本に、中央部を基準に左右対称なスパイラル溝を有し、かつゴム硬度が100以下のスパイラルゴムロールを用いる湿式法にて偏光フィルムを得るものである。

【0008】 前記製造方法の例を図1に示した。1が親水性高分子フィルムで、3が浴であり、2、5、6、7がその浴外又は浴液内に配置したガイドロール、4が浴液である。図例には、浴外及び浴液内に各2本のガイドロールを配置したものを示したが、本発明にてはその配置数について特に限定はなく、適宜な本数を浴外及び浴液内の適宜な位置に配置することができる。

【0009】 スパイラルゴムロールとしては、図2

(a)に例示の如くゴム層にその中央部を基準として左右対称なスパイラル溝を有し、かつゴム硬度が100以下のもの8が用いられる。スパイラル溝を中央部を基準に左右対称に設けることにより、そのスパイラル溝が末広がりとなる回転方向で親水性高分子フィルムを搬送することにより皺取りや折れ曲がり防止等の働きを作用させることができる。

【0010】 スパイラルゴムロールは、例えばゴム層に適宜な方式でスパイラル溝を設けることにより形成しうるが、その場合、前記した皺取り等の作用力は、スパイラル溝の幅やピッチや条数、ゴム層の材質やロールの周速度などにより制御することができる。

【0011】 前記において皺取りや押し跡傷発生防止等の点より好ましいスパイラル溝は、図2に例示した如く親水性高分子フィルムと接する部分が1mm以上、就中3mm以上、特に5mm～無限大(平坦)の曲率半径を有する状態に成形されたものであり、かつスパイラルの溝幅を

50mm以下、就中1~30mm、特に5~20mmとしたものである。

【0012】スパイラル溝の断面形状については、特に限定はなく、例えば図2(b)に例示した如きフラット面に断面半円の溝を形成したもの81、(c)に例示した如き断面三角波形のもの82、(d)に例示した如き断面半円波形のもの83、(e)に例示した如き断面矩形波形のもの84などの適宜な形状を有するものであってよい。その場合、図例の如く親水性高分子フィルムと接する部分、特にエッジ部は前記した如く所定の曲率半径を有する状態に成形されていることが好ましい。

【0013】一方、上記したスパイラル溝を設けるゴム層の硬度を100以下とすることにより、そのスパイラルゴムロールを溶液内に配置して膨潤した親水性高分子フィルムを浸漬搬送した場合にも、そのフィルムに破断や押し跡傷等の発生することを防止することができる。その防止効果や磨滅耐久性等の点より好ましいゴム硬度は、90以下、就中40~80、特に60~75である。なおゴム硬度は、JIS K 6301に基づく。

【0014】なお前記のゴム層は、適宜なゴムにて形成でき、そのゴム種について特に限定はない。ちなみにその例としては、天然ゴム(硬度10~100)やスチレンブタジエンゴム(硬度30~100)、ニトリルゴム(硬度15~100)やクロロプレンゴム(硬度10~90)、ブチルゴム(硬度25~85)やエチレンプロピレンゴム(硬度25~85)、クロルスルホン化ポリエチレンゴム(硬度50~95)やシリコーンゴム(硬度20~90)、フッ素ゴム(硬度55~80)やウレタンゴム(硬度10~99)などがあげられる。

【0015】本発明において、スパイラルゴムロールは浴外又は浴液内に配置されるガイドロールのうち、その1本又は2本以上に用いられ、ガイドロールの全部に用いることもできる。皺取り効果や安定搬送等の点よりは、ゴム硬度又はスパイラル溝の形状が相違する組合せにて2本以上のスパイラルゴムロールを配置することが好ましい。

【0016】またスパイラルゴムロールは、前記の如く浴外又は及び浴液内に配置できるが、親水性高分子フィルムの皺取り等の点よりは、浴液による膨潤にて皺等が発生しやすい浴液内に配置して、浴液内での親水性高分子フィルムの浸漬搬送に利用することが好ましい。

【0017】上記のように本発明は、所定のスパイラルゴムロールを用いて親水性高分子フィルムに二色性物質を含浸させて搬送しつつ延伸処理する湿式法により偏光フィルムを製造するものである。本発明にてはその製造の際に前記のスパイラルゴムロールを用いる点を除いては特に限定はない。

【0018】従って用いる親水性高分子フィルムや二色性物質、その含浸処理や浴液や延伸条件などについては従来に準じることができる。ちなみにその親水性高分子

フィルムとしては、例えばポリビニルアルコール系フィルムや部分ホルマール化ポリビニルアルコール系フィルム、エチレン・酢酸ビニル共重合体系部分ケン化フィルムなどがあげられ、二色性物質としては例えばヨウ素及び/又は二色性染料などがあげられる。

【0019】また親水性高分子フィルムへの二色性物質の含浸処理は、延伸処理と別個の工程で予め施すこともできるし、延伸処理と同じ浴内で施すこともできる。その場合、浴液としては前者では単なる水系浴液であってもよいが、後者の場合には、二色性物質を溶解させた水系浴液が用いられる。

【0020】さらに延伸処理は、例えばガイドロールの周速度に差を持たせて親水性高分子フィルムに伸張力を作用させる方式などにより達成でき、延伸倍率は50%以下、就中1~20%、特に2~10%が一般的である。形成する偏光フィルムの厚さは通例5~80μmであるが、これに限定されない。

【0021】なおその他の製造条件についても従来に準じることができ、例えば延伸処理工程に先立ち親水性高分子フィルムを予め膨潤処理しておくこともできる。本発明にてはその場合にも、上記したスパイラルゴムロールを用いて皺付き等を防止することが好ましい。

【0022】本発明による偏光フィルムは、液晶表示装置等の各種の光学装置の形成などに好ましく用いうるが、その実用に際しては偏光フィルムの片側又は両側に透明保護層を設けた偏光板とすることもできる。透明保護層の付加は、耐水性や取扱性の向上などを目的とする。

【0023】前記透明保護層の形成には、適宜な透明物質を用いうるが、就中、透明性及び機械的強度、熱安定性や水分遮蔽性等に優れたプラスチックなどが好ましく用いられる。その例としては、ポリエステル系樹脂やアセテート系樹脂、ポリエーテルサルホン系樹脂やポリカーボネート系樹脂、ポリアミド系樹脂やポリイミド系樹脂、ポリオレフィン系樹脂やアクリル系樹脂、あるいはアクリル系やウレタン系、アクリルウレタン系やエポキシ系やシリコーン系等の熱硬化型、ないし紫外線硬化型の樹脂などがあげられる。

【0024】透明保護層は、プラスチックの塗布方式やフィルムとしたものの接着層を介した積層方式などの適宜な方式で形成してよく、厚さも任意である。一般には500μm以下、就中1~300μm、特に5~200μmの厚さとされる。また透明保護層は、スティッキングの防止や拡散ないしアンチグレア等を目的に表面に微細凹凸構造を有するものとすることもできる。

【0025】表面微細凹凸構造の透明樹脂層の形成は、例えばシリカやアルミナ、チタニアやジルコニア、酸化錫や酸化インジウム、酸化カドミウムや酸化アンチモン等からなる、導電性のこともある無機系微粒子、架橋又は未架橋のポリマー等からなる有機系微粒子などの透明

微粒子を含有させる方式、サンドブラストやマット処理等にて表面を粗面化処理する方式などの適宜な方式で形成することができる。

【0026】

【実施例】例1

ゴム硬度が70のニトリルブタジエンゴムからなる直径70mm、面長500mmのゴム層に、図2(e)に示した断面形状からなる2条のスパイラル溝を溝幅10mm、溝深さ3mm、ピッチ20mm、リード40mmの条件で形成してなるスパイラルゴムロールを図1の符号5のガイドロールに用い、他のガイドロール2、6、7にフラットなゴムロールを用いて図1に準じた方法にて、ヨウ素を溶解した水からなる溶液中に幅400mm、厚さ20μmのポリビニルアルコールフィルムを2m/分の速度で導入*

*し、浸漬搬送して5%の延伸処理を施し、偏光フィルムを得た。なおスパイラル溝の突出部角部の曲率半径は約1.5mmとした。

【0027】例2

スパイラル溝の突出部角部に丸みをつけずに直角のままとしたゴムロールを用いたほかは例1に準じて偏光フィルムを得た。

【0028】例3

ゴム層の硬度を110としたゴムロールを用いたほかは例1に準じて偏光フィルムを得た。

【0029】評価試験

浴温度を20℃、30℃又は40℃とした場合の偏光フィルムの製造状況を調べた。その結果を次表に示した。

浴温度	例 1	例 2	例 3
20℃	異常なし	押し跡発生	押し跡発生
30℃	異常なし	押し跡発生	傷発生
40℃	異常なし	傷発生	傷発生

【0030】前記において、例3では、得られる偏光フィルムに著しい押し跡や傷が発生したが、例1では押し跡や傷等の異常が発生せず、外観が良好で品質の良好な偏光フィルムの得られた。また例2では例3ほど著しくはないが、得られる偏光フィルムに押し跡が発生し、高温側では傷も発生した。

【図面の簡単な説明】

【図1】実施例の説明図

※【図2】スパイラルゴムロールの説明図

【符号の説明】

1：親水性高分子フィルム 2, 5, 5, 7：ガイドロール

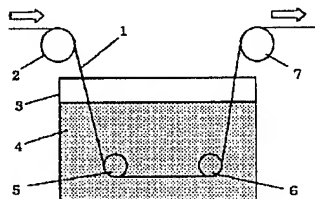
3：浴 4：浴液

8：スパイラルゴムロール

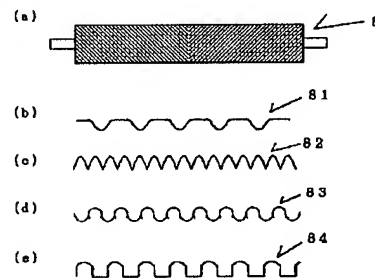
30 81, 82, 83, 84：スパイラル溝

※

【図1】



【図2】



PAT-NO: JP02000147252A
DOCUMENT-IDENTIFIER: JP 2000147252 A
TITLE: PRODUCTION OF POLARIZING FILM AND POLARIZING PLATE
PUBN-DATE: May 26, 2000

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APPL-NO: JP10334973
APPL-DATE: November 10, 1998

INT-CL (IPC): G02B005/30

ABSTRACT:

PROBLEM TO BE SOLVED: To develop a method for producing a polarizing film which can be used for a wet method while preventing fracture, impressions or the like by making use of spiral rubber rolls which hardly caused wrinkles or bending of a hydrophilic polymer film during transport.

SOLUTION: In this method, a hydrophilic polymer film 1 is impregnated with a dichromatic substance and dipped and transported in a soln. 4 by plural guide rolls 2, 5, 6, 7 disposed outside and inside the bath while the film is stretched to obtain a polarizing film. In this process, a spiral rubber roll having spiral grooves symmetric with respect to the central part and having ≤ 100 rubber hardness is used for at least one of the guide rolls 2, 5, 6, 7. Then

a transparent protective layer is formed on one or both surfaces of the polarizing film. By this method, the swollen hydrophilic polymer film hardly suffers fracture or the like and the wet method can be used favorably. Production of wrinkles can be prevented by the spiral effect and a polarizing film of good quality can be efficiently produced in a high yield.

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[Claim(s)]

[Claim 1] The manufacture approach of the polarization film characterized by in carrying out extension processing and manufacturing a polarization film, infiltrating the dichroism matter into a hydrophilic high polymer film, and carrying out immersion conveyance of the inside of bath liquid through two or more guide rolls arranged besides a bath and in bath liquid to have a symmetrical spiral slot on the basis of a center section in at least one of said guide roll, and for a rubber degree of hardness to use 100 or less spiral rubber covered roll for it.

[Claim 2] The manufacture approach which is a thing with a flute width of 50mm or less which fabricated the part to which a spiral rubber covered roll touches the hydrophilic high polymer film of the spiral slot in the condition of having the radius of curvature of 1mm or more, in claim 1.

[Claim 3] The manufacture approach of using two or more spiral rubber covered rolls in claim 1 or 2 in the combination from which the configuration of a rubber degree of hardness or a spiral slot is different.

[Claim 4] The manufacture approach which arranges a spiral rubber covered roll in bath liquid in claims 1-3.

[Claim 5] The polarizing plate characterized by coming to prepare transparent protection layer in one side or the both sides of a polarization film which it comes to manufacture by the approach according to claim 1 to 4.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the polarizing plate using the method of manufacturing efficiently the polarization film by which quality was stabilized with the wet method, and its polarization film.

[0002]

[Background of the Invention] As conventionally illustrated to drawing 1, as an approach of manufacturing a polarization film with the wet method which carries out extension processing, infiltrating the dichroism matter into the hydrophilic high polymer film 1 like an arrow head, and carrying out immersion conveyance of the inside of bath liquid 4 through two or more guide rolls 2, 5, 6, and 7 arranged within and without a bath 3, the approach a front face used a smooth thing as much as possible as a guide roll was learned.

[0003] However, the trouble which a wrinkle and bending tend to generate was in the hydrophilic high polymer film by the swelling at the time of carrying out immersion conveyance of the inside of bath liquid. When the conventional spiral rubber covered roll which formed the spiral slot in the front face for the purpose of the wrinkle picking etc. was used, many blemishes, such as incrustation of a rubber covered roll, remained on the polarization film which the hydrophilic high polymer film which carried out the on-the-strength fall by swelling fractures, and cannot apply a wet method or is obtained, and application of a wet method was substantially difficult for it too.

[0004]

[The technical technical problem of invention] Harnessing the advantage of the spiral rubber covered roll which a wrinkle or bending cannot generate easily in the hydrophilic high polymer film of conveyance, it prevents generating of fracture, an incrustation blemish, etc. and this invention makes a technical problem development of the manufacture approach of the polarization film which can apply a wet method.

[0005]

[Means for Solving the Problem] In carrying out extension processing and manufacturing a polarization film, this invention infiltrating the dichroism matter into a hydrophilic high polymer film, and carrying out immersion conveyance of the inside of bath liquid through two or more guide rolls arranged besides a bath and in bath liquid It has a symmetrical spiral slot on the basis of a center section in at least one of said guide roll. And the polarizing plate characterized by coming to prepare transparent protection layer in one side or the both sides of the manufacture approach of the polarization film characterized by a rubber degree of hardness using 100 or less spiral rubber covered roll and its polarization film is offered.

[0006]

[Effect of the Invention] Also when immersion conveyance of the inside of bath liquid is carried out through it by having used the spiral rubber covered roll of the above-mentioned features according to this invention, it can be hard to generate fracture, an incrustation blemish, etc. in the swollen hydrophilic high

polymer film, and a wet method can be applied good, and generating of a wrinkle, bending can also be prevented by the spiral effectiveness, and the good polarization film of quality can be efficiently manufactured with the sufficient yield.

[0007]

[Embodiment of the Invention] In carrying out extension processing and manufacturing a polarization film, the manufacture approach by this invention infiltrating the dichroism matter into a hydrophilic high polymer film, and carrying out immersion conveyance of the inside of bath liquid through two or more guide rolls arranged besides a bath and in bath liquid, it has a symmetrical spiral slot on the basis of a center section in at least one of said guide roll, and a rubber degree of hardness obtains a polarization film with the wet method using 100 or less spiral rubber covered roll.

[0008] The example of said manufacture approach was shown in drawing 1. 1 is a hydrophilic high polymer film, 3 is a bath, and the guide roll which 2, 5, 6, and 7 have arranged besides the bath and in bath liquid, and 4 are bath liquid. Although what has arranged the guide roll of two each besides a bath and in bath liquid was shown in the example of drawing, at this invention, there is especially no limitation about the number of arrangement, and a proper number can be arranged in the proper location besides a bath and in bath liquid.

[0009] As a spiral rubber covered roll, it has a symmetrical spiral slot on the basis of the center section in a rubber layer like instantiation at drawing 2 (a), and 100 or less thing 8 is used for a rubber degree of hardness. Work of wrinkle picking, bending prevention, etc. can be made to act by conveying a hydrophilic high polymer film in the hand of cut where the spiral slot serves as breadth at last by establishing a spiral slot in bilateral symmetry on the basis of a center section.

[0010] Although a spiral rubber covered roll can be formed by establishing a spiral slot for example, in a rubber layer by the proper method, applied force, such as wrinkle picking described above in that case, is controllable by the quality of the material of the width of face, pitch and number of start of a spiral slot, and a rubber layer, the peripheral velocity of a roll, etc.

[0011] It is fabricated by the condition that the part which touches a hydrophilic high polymer film as the spiral slot more desirable than points, such as wrinkle picking and incrustation blemish generating prevention, was illustrated to drawing 2 in the above has the radius of curvature of 5mm - infinity (flat) especially 3mm or more above all 1mm or more, and the flute width of a spiral is especially set to 5-20mm 1-30mm above all 50mm or less.

[0012] About the cross-section configuration of a spiral slot, especially limitation may have proper configurations, such as the thing 81 in which the slot of a cross-section semicircle was formed to the **** flat side which there is not, for example, was illustrated to drawing 2 (b), the thing 82 of the **** cross-section triangular waveform illustrated to (c), the thing 83 of a **** cross-section semicircle wave illustrated to (d), and the thing 84 of the **** cross-section square wave form illustrated to (e). In that case, as for the part which touches a hydrophilic high polymer film, especially the edge section, it is desirable like the example of drawing to be fabricated by the condition of having predetermined radius of curvature as described above.

[0013] Also when immersion conveyance of the hydrophilic high polymer film which arranges and swelled the spiral rubber covered roll in bath liquid by making or less into 100 the degree of hardness of the rubber layer which, on the other hand, prepares the above-mentioned spiral slot is carried out, it can prevent generating [blemish / fracture, / incrustation] on the film. Rubber degrees of hardness more desirable than points, such as the prevention effectiveness, wear endurance, etc., are 40-80, especially 60-75 above all 90 or less. In addition, a rubber degree of hardness is JIS. K It is based on 6301.

[0014] In addition, the aforementioned rubber layer can be formed with proper rubber, and there is especially no limitation about the rubber kind. Incidentally as the example, natural rubber (degrees of hardness 10-100), styrene butadiene rubber (degrees of hardness 30-100), nitrile rubber (degrees of hardness 15-100) and chloroprene rubber (degrees of hardness 10-90), isobutylene isoprene rubber (degrees of hardness 25-85) and ethylene propylene rubber (degrees of hardness 25-85), Krol sulfonation polyethylene rubber (degrees of hardness 50-95), silicone rubber (degrees of hardness 20-90), a fluororubber (degrees of hardness 55-80), polyurethane rubber (degrees of hardness 10-99), etc. are raised.

[0015] In this invention, a spiral rubber covered roll is used for its 1 or 2 or more in the guide roll arranged besides a bath and in bath liquid, and can also be used for all of guide rolls. It is more desirable than points, such as the wrinkle picking effectiveness and stable conveyance, to arrange two or more spiral rubber covered rolls in the combination from which the configuration of a rubber degree of hardness or a spiral slot is different.

[0016] Moreover, although a spiral rubber covered roll can be arranged besides a bath and in bath liquid like the above, it is more desirable than points, such as wrinkle picking of a hydrophilic high polymer film, to arrange in the bath liquid which a wrinkle etc. tends to generate in the swelling by bath liquid, and to use for immersion conveyance of the hydrophilic high polymer film within bath liquid.

[0017] It manufactures a polarization film as mentioned above with the wet method which carries out extension processing, this invention infiltrating the dichroism matter into a hydrophilic high polymer film using a predetermined spiral rubber covered roll, and conveying it. If the point using the aforementioned spiral rubber covered roll is removed in this invention in the case of the manufacture, there is especially no limitation.

[0018] Therefore, about the hydrophilic high polymer film and dichroism matter to be used, its sinking-in processing and bath liquid, or extension conditions, it can apply to the former correspondingly.

Incidentally, as the hydrophilic high polymer film, a polyvinyl alcohol system film, a partial formal-ized polyvinyl alcohol system film, an ethylene-vinylacetate copolymer system partial saponification film, etc. are raised, for example, and iodine, dichromatic dye, etc. are raised as dichroism matter.

[0019] Moreover, sinking-in processing of the dichroism matter to a hydrophilic high polymer film can also be beforehand performed at a process separate from extension processing, and can also be performed within the same bath as extension processing. In that case, although you may be mere drainage system bath liquid in the former as bath liquid, in the case of the latter, the drainage system bath liquid in which the dichroism matter was dissolved is used.

[0020] The method which a difference is given [method] to the peripheral velocity of for example, a guide roll, and makes the elongation force act on a hydrophilic high polymer film can attain extension processing, and 2 - 10% of especially draw magnification is still more general 1 to 20% above all 50% or less.

Although the thickness of the polarization film to form is 5-80 micrometers usually, it is not limited to this.

[0021] In addition, it can apply to the former correspondingly also about other manufacture conditions, for example, swelling processing of the hydrophilic high polymer film can also be beforehand carried out in advance of extension down stream processing. It is desirable to prevent with a wrinkle etc. also in such a case using the above-mentioned spiral rubber covered roll in this invention.

[0022] Although the polarization film by this invention can be preferably used for formation of various kinds of optical equipments, such as a liquid crystal display, etc., it can also be used as the polarizing plate which prepared transparent protection layer in one side or the both sides of a polarization film on the occasion of the practical use. Addition of transparent protection layer aims at improvement in a water resisting property or handling nature etc.

[0023] Although the proper transparence matter can be used for formation of said transparent protection layer, the plastics which is excellent in transparency, a mechanical strength and thermal stability, moisture electric shielding nature, etc. is used preferably above all. As the example, the resin of heat-curing molds, such as polyester system resin, acetate system resin, polyether sulphone system resin and polycarbonate system resin, polyamide system resin and polyimide system resin, polyolefine system resin and acrylic resin or acrylic and an urethane system, an acrylic urethane system, an epoxy system, and a silicone system, thru/or an ultraviolet curing mold etc. is raised.

[0024] Although transparent protection layer considered as the spreading method and film of plastics, it may be formed by the method with the proper laminating method through a glue line etc., and its thickness is also arbitrary. Especially generally let 1-300-micrometer 500 micrometers or less above all be the thickness of 5-200 micrometers. Moreover, transparent protection layer shall have detailed irregularity structure on a front face for the purpose of prevention, diffusion thru/or an anti glare of sticking, etc.

[0025] The conductive thing which consists of a silica, an alumina, a titania and a zirconia, tin oxide and indium oxide, cadmium oxide, antimony oxide, etc. can also form formation of the transparence resin layer of surface detailed irregularity structure by the method with the proper method which carries out the surface roughing process of the front face by the method and sandblasting which make transparence particles, such as an organic system particle which consists of a polymer for which a bridge is not constructed [a certain inorganic system particle, bridge formation, or], contain, mat processing, etc.

[0026]

[Example] The diameter of 70mm which an example 1 rubber degree of hardness becomes from the nitril butadiene rubber of 70, The spiral slot of two articles which becomes the rubber layer of 500mm of field length from the cross-section configuration shown in drawing 2 (e) The flute width of 10mm, The spiral rubber covered roll which it comes to form on conditions (channel depth [of 3mm] and pitch 20mm and lead 40mm) is used for the guide roll of the sign 5 of drawing 1 . By the approach which applied to other

guide rolls 2, 6, and 7 correspondingly at drawing 1 using the flat rubber covered roll The polyvinyl alcohol film with a width of face [of 400mm] and a thickness of 20 micrometers was introduced the rate for 2m/into the bath liquid which consists of water which dissolved iodine, immersion conveyance was carried out, 5% of extension processing was performed, and the polarization film was obtained. In addition, the radius of curvature of the lobe corner of a spiral slot was set to about 1.5mm.

[0027] The rubber covered roll considered as as [right angle], without rounding the lobe corner of an example 2 spiral slot was used, and also the polarization film was obtained according to Example 1.

[0028] The rubber covered roll which set the degree of hardness of an example 3 rubber layer to 110 was used, and also the polarization film was obtained according to Example 1.

[0029] The manufacture situation of the polarization film at the time of making whenever [evaluation trial bath temperature] into 20 degrees C, 30 degrees C, or 40 degrees C was investigated. The result was shown in degree table.

浴温度	例 1	例 2	例 3
20℃	異常なし	押し跡発生	押し跡発生
30℃	異常なし	押し跡発生	傷発生
40℃	異常なし	傷発生	傷発生

[0030] In the above, although remarkable incrustation and a remarkable blemish occurred on the polarization film obtained in Example 3, in Example 1, abnormalities, such as incrustation and a blemish, did not occur, but the appearance was good and the good polarization film of quality was obtained. Moreover, in Example 2, incrustation occurred on the polarization film obtained although it is not remarkable about three example, and the blemish was also generated in the elevated-temperature side.

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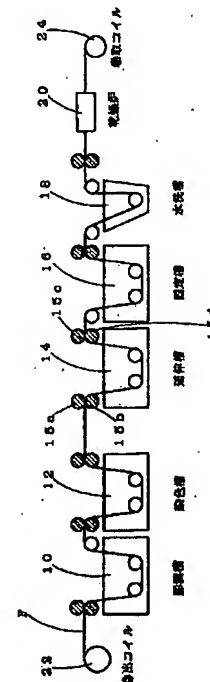
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(54) 【発明の名称】 偏光フィルムの製造方法

(57) 【要約】

【課題】 偏光フィルムの光学特性等の品質安定を図るための製造方法を提供すること。

【解決手段】 ポリビニルアルコール (PVA) 樹脂による偏光フィルム基材を膨潤させる膨潤工程と、この膨潤工程を経た偏光フィルム基材をヨウ素染色する工程と、このヨウ素染色工程を経た偏光フィルム基材を延伸する工程と、この延伸工程を経た偏光フィルム基材にヨウ素染色剤を定着させる固定化工程と、この固定化工程を経た偏光フィルム基材を乾燥する工程とを順次経て偏光フィルムを製造するに際し、前記膨潤工程において前記偏光フィルム基材を膨潤させる水にホウ酸を0.05～0.10重量%濃度配合している。



【特許請求の範囲】

【請求項1】 偏光フィルム基材を膨潤させる膨潤工程と、該膨潤工程を経た偏光フィルム基材を染色する工程と、該染色工程を経た偏光フィルム基材を延伸する工程と、該延伸工程を経た偏光フィルム基材に前記染色剤を定着させる固定化工程と、該固定化工程を経た偏光フィルム基材を乾燥する工程とを含み、前記膨潤工程において前記偏光フィルム基材をホウ酸濃度0.05～0.10重量%のホウ酸水溶液により膨潤させるようにしたことを特徴とする偏光フィルムの製造方法。

【請求項2】 前記膨潤工程において液温は30～40℃の範囲にあり、前記偏光フィルム基材の浸せき時間は4～6分の範囲にあることを特徴とする請求項1に記載される偏光フィルムの製造方法。

【請求項3】 前記偏光フィルム基材が乾燥工程を経た状態で20～35μm厚のポリビニルアルコール樹脂フィルムであることを特徴とする請求項1又は2に記載される偏光フィルムの製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、液晶ディスプレイ等に適用される偏光フィルムの製造方法に関するものである。

【0002】

【従来の技術】従来、液晶ディスプレイ等においてパネル面が見易いようにその液晶パネル面に偏光フィルムが設けられている。この偏光フィルムは、図2にその断面構造を示したように、透明なポリビニルアルコール(PVA)樹脂材料による偏光機能フィルム(以下、これを「偏光子」と称する)30の両面に、同じく透明なトリアセチルセルロース(TAC)樹脂材料による保護フィルム層(以下、これを「TAC層」と称する)32a、32bが設けられ、表面側のTAC層32aには、さらにアクリル系、あるいはシリコン系のハードコート層34が設けられる。

【0003】そしてそのハードコート層34の上に必要に応じて金属酸化物やフッ素化合物による透明な反射防止膜36が形成され、さらに運搬や取扱い時の最表面の疵防止のため保護(プロテクト)フィルム38が貼着される。また裏面側のTAC層32bには例えばアクリル系材料による粘着剤40を介してポリエチレンテレフタレート(PET)樹脂材料等を基材とする離型フィルム42が貼着される。

【0004】そしてこの偏光フィルムF_aを液晶ディスプレイ等に使用するに際しては、同じく図2に示したように、離型フィルム42とプロテクトフィルム38を剥がし、液晶44が一对のガラス基板46a、46bの間に挟まれた液晶パネル48の表面に貼着される。また液晶パネル48の裏面側にもこの偏光フィルムF_bは貼着されるが、この裏面側の偏光フィルムF_bには反射防止

膜36やハードコート層34は設けられていない。

【0005】しかしこの偏光フィルムF_a、F_bの製造方法としては、前述の偏光子30の基材材料であるポリビニルアルコール(PVA)樹脂フィルムの下地処理としてPVA樹脂フィルムに水を含浸膨潤させる膨潤工程、この膨潤した樹脂フィルムをヨウ素溶液で染色する工程、染色した樹脂フィルムを延伸する工程、前述のヨウ素染色剤を樹脂フィルムの表面に固定化する工程、そして乾燥工程の各工程により処理するものが一般的に行われている。

【0006】これらの各工程の中でPVA樹脂フィルムの最初の膨潤工程は、PVA樹脂フィルムに水分を含浸させて膨潤させることにより次工程の染色工程において樹脂フィルムへのヨウ素染色が効率良く行われる。また後続の延伸工程においてPVA樹脂フィルムの分子配列が規則正しくなって偏光性能が向上するという面も有しており、必須の工程として欠かすことができないものである。

【0007】

【発明が解決しようとする課題】しかしながら、前述のPVA樹脂フィルムの膨潤工程において、その樹脂フィルムの膨潤度は従来それ程管理されていない。そのためにPVA樹脂フィルムがややもすると過度に膨潤されることがある。そしてこのようなPVA樹脂フィルムの膨潤度のバラツキがあると、次のヨウ素染色工程においてヨウ素の染色度に差異が生じ、PVA樹脂フィルムの偏光性能等の光学特性が安定しないという問題が生じる。

【0008】またPVA樹脂フィルムが過度に膨潤されると、樹脂フィルムに製造ラインでシワが発生し、樹脂フィルム面にシワが存在することにより光学特性が損なわれることもある。さらに製造ラインで樹脂フィルムにシワが発生すると蛇行しフィルムの走行性が悪くなって延伸が不均一となり、その結果品質が不安定になるという問題があった。

【0009】本発明の解決しようとする課題は、偏光フィルム基材の膨潤度を管理することにより偏光性能等の光学特性の安定化を図り、また製造ラインでの偏光フィルム基材へのシワ発生を回避してフィルム走行性の安定、ひいては品質管理面での安定化を図ることのできる偏光フィルムの製造方法を提供することにある。

【0010】

【課題を解決するための手段】この課題を解決するため本発明に係る偏光フィルムの製造方法は、偏光フィルム基材を膨潤させる膨潤工程と、該膨潤工程を経た偏光フィルム基材を染色する工程と、該染色工程を経た偏光フィルム基材を延伸する工程と、該延伸工程を経た偏光フィルム基材に前記染色剤を定着させる固定化工程と、該固定化工程を経た偏光フィルム基材を乾燥する工程とを含み、前記膨潤工程において前記偏光フィルム基材をホウ酸濃度0.05～0.10重量%のホウ酸水溶液により

膨潤させるようにしたことを要旨とするものである。

【0011】この場合に前記膨潤工程における水溶液のホウ酸濃度の適正範囲は、液温や偏光フィルム基材の浸せき時間によっても変わるが、通常液温30～40℃、浸せき時間4～6分間の条件の下で、0.05～0.10重量%の範囲にあることが望ましい。

【0012】ホウ酸濃度が0.05重量%以下であると、製造ラインにおいてフィルムの走行性が確保できない。つまりフィルムが製造ライン上を蛇行し、フィルム表面にシワが発生したり、あるいは時にフィルム破断を起こしたりする。これは特に固定槽の液温が延伸槽の液温よりも低いためにフィルムが収縮することと、シワ発生によりフィルムの幅方向での張力のバランスがくずれること起因するものである。

【0013】一方ホウ酸濃度が0.10重量%を越えると、偏光特性の低下が見られる。これはホウ酸濃度を増す程フィルムの膨潤度が低下し、そのフィルム膨潤度の低下によって染色性が落ちたことに起因するものである。尚、偏光フィルム基材としては一般にポリビニルアルコール(PVA)樹脂フィルムが用いられ、そのフィルム厚さは乾燥工程を経た状態でおよそ20～35μmとされている。

【0014】

【発明の実施の形態】以下、本発明の好適な実施例を詳細に説明する。まず初めに本発明を実現する製造ライン並びに工程図を図1に示して説明する。図示されるようにこの製造ラインは、膨潤槽10、染色槽12、延伸槽14、固定槽16、水洗槽18、及び乾燥炉20とから構成される。

【0015】本発明の偏光フィルム基材である50～100μm厚の透明なポリビニルアルコール(PVA)樹脂フィルムFは、巻出コイル22から巻き出されて膨潤槽10、染色槽12、延伸槽14、固定槽16、水洗槽18、及び乾燥炉20を順次経た後巻取コイル24に巻き取られる。

【0016】膨潤槽10ではPVA樹脂フィルムFは水に浸せきされて膨潤される。フィルムFは、通常液温35℃の湯に5分間弱浸せきされることにより湿潤し膨潤されるものである。本発明では、この膨潤槽10の水に0.05～0.10重量%濃度のホウ酸(H₃BO₃)が配合されるものである。

【0017】次の染色槽12では、膨潤したPVA樹脂フィルムFがヨウ素溶液により染色される。この染色槽12には通常、3重量%濃度のヨウ化カリウム(KI)、1重量%濃度のホウ酸、及び0.023重量%濃

度のヨウ素(I₂)が配合されている。この染色槽12の液温は35℃で、フィルムの浸せき時間はおおよそ80秒間である。

【0018】次の延伸槽14では、ヨウ素染色されたPVA樹脂フィルムFが製造ライン方向に延伸される。延伸槽14の入側のニップローラ15a、15bと出側のニップローラ15c、15dとのスピード差によりフィルムに張力が掛かるようにしている。この延伸槽14の液組成は、通常ホウ酸濃度3重量%、ヨウ化カリウム(KI)濃度3重量%としている。そして液温は50℃でフィルムの浸せき時間はおおよそ50秒間、延伸倍率は1.3倍としている。

【0019】次の固定槽16では、染色延伸されたPVA樹脂フィルムF内のポリヨウ素が定着される。この固定槽16の液組成は、通常ホウ酸濃度3重量%、ヨウ化カリウム(KI)濃度0.5重量%としている。そして液温は35℃でフィルムの浸せき時間はおおよそ40秒間としている。

【0020】次の水洗槽18では、実際にはおおよそ20℃のシャワー水がフィルム面に噴霧され、フィルム面に付着しているホウ酸等の薬品が洗い流される。また最終工程の乾燥炉20では、熱風(おおよそ90℃)がフィルム面に吹き付けられる。熱風の吹き付け時間はおおよそ70秒間である。この乾燥工程を経た状態でPVA樹脂フィルムの厚さはおよそ20～35μmとされる。

【0021】次に各種の試験を行ったのでその試験結果を説明する。次の表1は、各種の条件下での試験結果を示したものである。試験条件としては、膨潤槽10の水溶液中のホウ酸濃度を0%重量～0.125%重量までの範囲で6段階(0%、0.025%、0.050%、0.075%、0.100%、0.125%)を採用している。また液温は30℃～40℃の範囲で3条件(30℃、35℃、40℃)を選び、さらにフィルムの浸せき時間も4分～6分の範囲で3条件(4分、5分、6分)を選んでいる。

【0022】そして表1にはこれらの試験条件のうち、1)最も膨潤度が低くなる条件(浸せき時間4分、液温30℃)
2)最も膨潤度が高くなる条件(浸せき時間6分、液温40℃)
3)条件範囲の中心となる条件(浸せき時間5分、液温35℃)
で行った結果を示している。

【0023】

【表1】

条 件			特 性			
浸せき時間 (min)	温度 (℃)	ホウ酸濃度 (%)	偏光度σ (%)	単体透過率σ (%)	光学特性	走行性
4	30	0	0.004	0.503	×	×
		0.025	0.003	0.486	×	△~○
		0.050	0.003	0.112	○	○
		0.075	0.003	0.130	○	○
		0.100	0.005	0.073	○	○
		0.125	0.003	0.095	×	○
5	35	0	0.003	0.669	×	×
		0.025	0.003	0.489	×	△
		0.050	0.004	0.157	△	○
		0.075	0.003	0.138	○	○
		0.100	0.003	0.095	○	○
		0.125	0.005	0.092	×	○
6	40	0	0.006	0.898	×	×
		0.025	0.004	0.571	×	×
		0.050	0.003	0.179	△	△
		0.075	0.004	0.146	○	○
		0.100	0.002	0.092	○	○
		0.125	0.003	0.108	×	○

【0024】フィルムの特性試験としては、偏光度、単体透過率、光学特性、及び製造ラインでの走行性の各項目を挙げ、これらの項目について光学的測定、あるいは目視による検査により特性評価を行った。

【0025】その中で偏光フィルムの基本光学特性の測定は偏光プリズム法により行い、測定器は大塚電子社の“MCPD-1000 28C”を用いた。測定パラメ*30

*ータとしては、380nm~800nmの波長特性のスペクトルにおいてプリズムとの平行透過率 K_1 (%)、及びプリズムとの直交透過率 K_2 (%)を測定し、偏光度 V と単体透過率 Y とをそれぞれ次の数1により算出した。

【0026】

【数1】

$$\text{偏光度 } V = \frac{K_1 - K_2}{K_1 + K_2} \times 100 [\%]$$

$$\text{単体透過率 } Y = \frac{K_1 + K_2}{2} [\%]$$

【0027】ただ偏光度 V 、単体透過率 Y 共に製造条件毎に値が変動するため相対比較はしにくいと考え、表1にはそれぞれ標準偏差 σ を示した。ライン走行中に各条件30分間の間に1分間経過毎に測定し、合計31回($N=31$)の測定値から標準偏差 σ を算出し、示した※50

※ものである。

【0028】そして光学特性の評価としては、偏光度 V については各サンプルともそれ程有意差はなかったので、単体透過率 σ (%)の値と染色度合いによって特性評価を行った。表1中、「○印」は良好、「△印」は一

部問題あり、「×印」は不良の評価である。この場合単体透過率 σ (%)の評価は、 σ の値が大きい程製造ライン方向の光学特性のバラツキが大きいということで $\sigma < 0.150$ を良好(○印)、 $0.150 \leq \sigma < 0.200$ を△印、 $\sigma \geq 0.200$ を不良(×印)と判定した。

【0029】またライン走行性の評価は、フィルム表面のシワの発生具合により行い、全くシワのないものを良好(○印)、ややシワの発生が認められるものを△印、シワの発生が目立つものを不良(×印)と判定した。光学特性のバラツキとシワの発生具合との間にある程度の相関性が認められる。

【0030】しかして表1の試験結果をみるに、初めに、1)最も膨潤度が低くなる条件(浸せき時間4分、液温30℃)の特性評価では、膨潤槽のホウ酸濃度が0%及び0.025%程度では光学特性にバラツキがあり、ライン走行性(シワ発生)も少し問題があるとの結果が得られた。そしてホウ酸濃度が0.050%、0.075%、及び0.100%では光学特性のバラツキもなく、ライン走行性(シワ発生)も良好であるとの結果が得られた。しかしホウ酸濃度0.125%の場合にはフ

ィルムの染色不良が認められた。したがって膨潤槽のホウ酸濃度の最適範囲は、0.05~0.10重量%であるとの判定が得られた。

【0031】次に、2)最も膨潤度が高くなる条件(浸せき時間6分、液温40℃)の特性評価をみるに、上述の1)最も膨潤度が低くなる条件(浸せき時間4分、液温30℃)の場合とほとんど評価が変わらない。ややホウ酸濃度が0.050%のときに光学特性のバラツキ、及びライン走行によるシワ発生が認められたが、これは誤差範囲とみている。したがってこの膨潤度が最も高くなる条件のときも膨潤槽のホウ酸濃度が0.05~0.10重量%の範囲で良好との評価が得られた。

【0032】さらに、3)条件範囲の中心となる条件(浸せき時間5分、液温35℃)の特性評価も、上述の1)最も膨潤度が低くなる条件(浸せき時間4分、液温30℃)、及び2)最も膨潤度が高くなる条件(浸せき時間5分、液温35℃)の場合とほとんど変わらない評価であった。膨潤槽のホウ酸濃度の適正範囲は、0.05~0.10重量%である。

【0033】以上の試験結果をまとめるに、本実施例では膨潤槽にホウ酸を配合することにより偏光フィルムの単体透過率のバラツキ(σ)が抑制され、光学特性の改善が認められると共に、フィルム面のシワ発生もなく良

好なライン走行性が得られることが確認された。そしてそのホウ酸濃度の適正範囲としては、0.05~0.10重量%が望ましく、0.10重量%を越えると逆に染色不良を起こして光学特性が損なわれることも確認された。

【0034】以上実施例について詳述したが本発明は上記した実施例に何ら限定されるものではなく、本発明の趣旨を逸脱しない範囲で種々の改変が可能である。例えば、膨潤槽にさらに膨潤助剤を添加したり、染色槽、固定槽等の液組成が本実施例と異なるものであっても本発明が適用され得るものである。また、偏光フィルムの基材もポリビニルアルコール(PVA)樹脂フィルムの改良品、あるいはそれ以外の樹脂フィルム素材にも適用されることは勿論である。

【0035】

【発明の効果】本発明は、膨潤工程、ヨウ素染色工程、延伸工程、固定化工程、乾燥工程等からなる連続製造ラインを経て偏光フィルムが製造されるに際して、ヨウ素染色前の膨潤工程において偏光フィルム基材にホウ酸濃度0.05~0.10重量%のホウ酸水を含浸させて膨潤させるようにしたものである。

【0036】したがって偏光フィルム基材の膨潤度がコントロールされて偏光性能等の光学特性のバラツキが解消され、製造ラインにおいてまたフィルム基材表面のシワの発生もなくなり、品質の安定化が得られる。そしてこれにより偏光フィルムの品質管理が容易となり、製品歩留りの向上も図れ、製品コストの低廉化にも寄与するものである。

【図面の簡単な説明】

【図1】本発明を実現するための製造ライン及び工程を示した図である。

【図2】本発明の偏光フィルムを液晶ディスプレイに適用した例の断面構成図である。

【符号の説明】

10 膨潤槽

12 染色槽

14 延伸槽

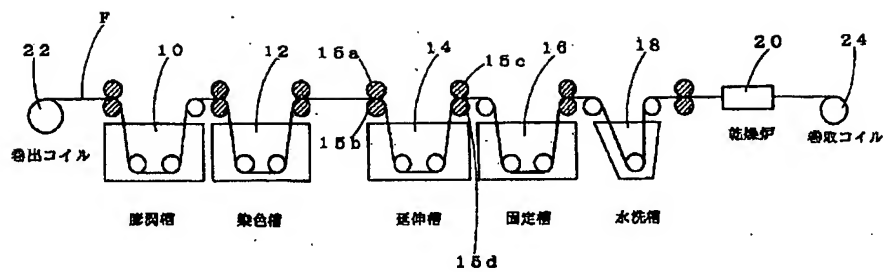
16 固定槽

18 水洗槽

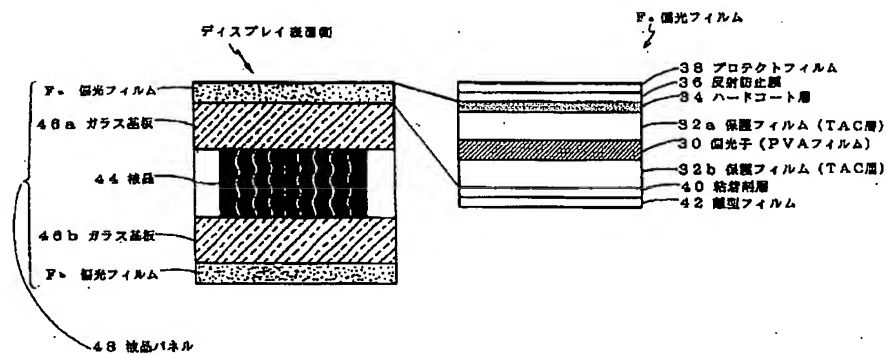
20 乾燥炉

F 偏光フィルム基材(ポリビニルアルコール樹脂フィルム)

【図1】



【図2】



フロントページの続き

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ABSTRACT:

PROBLEM TO BE SOLVED: To stabilize the optical characteristics, such as polarization performance of a polarizer film, to avert the occurrence or wrinkling on a polarizing film base material in a production line, and to stabilize the traveling property of the film, and consequently to stabilize quality management, by swelling the polarizing film base material with an aq. boric acid soln. having a specific concn. of boric acid.

SOLUTION: A PVA resin film is usually immersed for about 5 minutes in hot water kept at 35°C liquid temp. in a swelling vessel 10 and is thereby swollen. The water of the swelling vessel 10 is compounded with the boric acid (H3BO3) of the concn. of 0.05 to 0.10wt.%. The

swollen PVA resin film is dyed by a iodine soln. in the next dyeing vessel 12. The PVA resin film dyed with the iodine is stretched in the production line direction in the next stretching vessel 14. The polyiodine in the dyed and stretched PVA resin film is fixed in the next fixing vessel 16. The chemicals, such as boric acid, sticking to the film surface are washed away in the next washing vessel 18. Hot air is blown to the film surface in the drying furnace 20 of the final stage.

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[Claim(s)]

[Claim 1] The swelling process which makes a polarization film base material swell, and the process which dyes the polarization film base material which passed through this swelling process, The process which extends the polarization film base material which passed through this dyeing process, and the fixed process which fixes said stain to the polarization film base material which passed through this drawing process, The manufacture approach of the polarization film characterized by making it make said polarization film base material swell in said swelling process with the boric-acid water solution of 0.05 - 0.10 % of the weight of boric-acid concentration including the process which dries the polarization film base material which passed through this fixed process.

[Claim 2] It is the manufacture approach of the polarization film indicated by claim 1 characterized by for solution temperature being in the range of 30-40 degrees C in said swelling process, and the dipping time amount of said polarization film base material being in the range for 4 - 6 minutes.

[Claim 3] The manufacture approach of a polarization film that said polarization film base material is indicated by claim 1 characterized by being the polyvinyl-alcohol-resin film of 20-35-micrometer thickness, or 2 in the condition of having passed through the desiccation process.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of the polarization film applied to a liquid crystal display etc.

[0002]

[Description of the Prior Art] Conventionally, in the liquid crystal display etc., the polarization film is prepared in the liquid crystal panel side so that a panel side may be legible. The polarization functional film according to a transparent polyvinyl alcohol (PVA) resin ingredient as this polarization film showed that cross-section structure to drawing 2 The protection film layer by the transparent triacetyl cellulose (TAC) resin ingredient same with both sides of 30 (This is hereafter called a "polarizer") (This is hereafter called a "TAC layer") 32a and 32b are prepared and the rebound ace court layer 34 of acrylic or a silicon system is further formed in TAC layer 32a by the side of a front face.

[0003] And on the rebound ace court layer 34, the transparent antireflection film 36 by the metallic oxide or the fluorine compound is formed if needed, and the protection (protection) film 38 is further stuck for haulage or crack prevention of the outermost surface at the time of handling. Moreover, the mold releasing film 42 which uses a polyethylene terephthalate (PET) resin ingredient etc. as a base material through the binder 40 by the acrylic ingredient is stuck on TAC layer 32b by the side of a rear face.

[0004] And this polarization film Fa As it faces using it for a liquid crystal display etc. and was similarly shown in drawing 2 , a mold releasing film 42 and the protection film 38 are removed, and liquid crystal 44 is stuck on the front face of the liquid crystal panel 48 inserted among the glass substrates 46a and 46b of a couple. moreover, the rear-face side of a liquid crystal panel 48 -- this polarization film Fb although stuck - - polarization film Fb by the side of this rear face **** -- neither the antireflection film 36 nor the rebound ace court layer 34 is formed.

[0005] however, as the manufacture approach of the polarization films Fa and Fb of a lever The swelling process which makes a PVA resin film carry out impregnation swelling of the water as surface treatment of the polyvinyl alcohol (PVA) resin film which is the charge of a base material of the above-mentioned polarizer 30, Generally what is processed according to each process of the process which dyes this swollen resin film with an iodine solution, the process which extends the dyed resin film, the process which fixes the above-mentioned iodine stain on the front face of a resin film, and a desiccation process is performed.

[0006] In the dyeing process of degree process, iodine dyeing to a resin film is efficiently performed by the swelling process of the beginning of a PVA resin film carrying out impregnation of the moisture to a PVA resin film, and making it swell in each of these processes. Moreover, in a consecutive drawing process, the molecular arrangement of a PVA resin film becomes regular, and it also has the field that polarizability improves, and is indispensable as an indispensable process.

[0007]

[Problem(s) to be Solved by the Invention] However, in the swelling process of the above-mentioned PVA

resin film, the degree of swelling of the resin film is not managed so much conventionally. A PVA resin film is apt to swell [therefore,] too much. And if there is variation in the degree of swelling of such a PVA resin film, in the following iodine dyeing process, a difference will arise in whenever [dyeing / of iodine], and the problem that optical properties, such as polarizability of a PVA resin film, are not stabilized will arise.

[0008] Moreover, when a PVA resin film swells too much, Siwa occurs with a production line on a resin film, and an optical property may be spoiled when Siwa exists in a resin film plane. There was a problem that move in a zigzag direction if Siwa furthermore occurs on a resin film with a production line, and the performance traverse of a film worsened, a drawing became uneven, and quality became instability as a result.

[0009] The technical problem which is going to solve this invention is by managing the degree of swelling of a polarization film base material to offer the manufacture approach of a polarization film that stabilization of optical properties, such as polarizability, is attained, and Siwa generating to the polarization film base material in a production line can be avoided, and stabilization in the stability, as a result the quality control side of film performance traverse can be attained.

[0010]

[Means for Solving the Problem] The manufacture approach of the polarization film applied to this invention in order to solve this technical problem The swelling process which makes a polarization film base material swell, and the process which dyes the polarization film base material which passed through this swelling process, The process which extends the polarization film base material which passed through this dyeing process, and the fixed process which fixes said stain to the polarization film base material which passed through this drawing process, Let it be a summary to have made it make said polarization film base material swell in said swelling process with the boric-acid water solution of 0.05 - 0.10 % of the weight of boric-acid concentration including the process which dries the polarization film base material which passed through this fixed process.

[0011] In this case, although the proper range of the boric-acid concentration of the water solution in said swelling process changes also by the dipping time amount of solution temperature or a polarization film base material, it is usually desirable [the range] under the conditions for [30-40 degrees-C / of solution temperature /, and dipping time amount] 4 - 6 minutes that it is in 0.05 - 0.10% of the weight of the range.

[0012] Boric-acid concentration is 0.05. In a production line, the performance traverse of a film is not securable in it being below weight %. That is, a film moves a production-line top in a zigzag direction, Siwa occurs on a film front face, or film fracture is sometimes caused. This originates in that a film contracts since especially the solution temperature of a fixed tub is lower than the solution temperature of a drawing bath, and the balance of the tension in the cross direction of a film collapsing according to Siwa generating.

[0013] On the other hand, boric-acid concentration is 0.10. If weight % is exceeded, lowering of a polarization property will be seen. The degree of swelling of a film falls, so that this increases boric-acid concentration, and it originates in the dye affinity having fallen by lowering of the film degree of swelling. In addition, generally as a polarization film base material, a polyvinyl alcohol (PVA) resin film is used, and the film thickness is set to about 20-35 micrometers in the condition of having passed through the desiccation process.

[0014]

[Embodiment of the Invention] Hereafter, the suitable example of this invention is explained to a detail. Process drawing is shown and explained to the production-line list which realizes this invention first at drawing 1 . This production line consists of the swelling tub 10, a coloring tank 12, a drawing bath 14, a fixed tub 16, a rinse tank 18, and a drying furnace 20 so that it may be illustrated.

[0015] After the transparent polyvinyl alcohol (PVA) resin film F of 50-100-micrometer thickness which is the polarization film base material of this invention begins to be rolled from the **** coil 22 and passes through the swelling tub 10, a coloring tank 12, a drawing bath 14, the fixed tub 16, a rinse tank 18, and a drying furnace 20 one by one, it is rolled round by the winding coil 24.

[0016] In the swelling tub 10, the dipping of the PVA resin film F is carried out to water, and it is swollen. By usually carrying out a weak dipping to the molten bath of 35 degrees C of solution temperature for 5 minutes, humidity of the film F is carried out and it is swollen. In this invention, the boric acid (H3BO3) of concentration is blended with the water of this swelling tub 10 0.05 to 0.10% of the weight.

[0017] The swollen PVA resin film F is dyed by the iodine solution in the following coloring tank 12. The iodine (I2) of the boric acid of the potassium iodide (KI) of concentration and 1-% of the weight

concentration and 0.023-% of the weight concentration is usually blended with this coloring tank 12 3% of the weight. The solution temperature of this coloring tank 12 is 35 degrees C, and the dipping time amount of a film is for about 80 seconds.

[0018] In the following drawing bath 14, the PVA resin film F by which iodine dyeing was carried out is extended in the direction of a production line. He is trying to apply tension to a film according to the carrier rollers 15a and 15b by the side of close [of a drawing bath 14], and carrier rollers [by the side of appearance / 15c and 15d] speed difference. The liquid presentation of this drawing bath 14 is usually made into 3 % of the weight of boric-acid concentration, and 3 % of the weight of potassium iodide (KI) concentration. And for the dipping time amount of a film, for about 50 seconds and draw magnification are [solution temperature] 1.3 at 50 degrees C. It may be twice.

[0019] In the following fixed tub 16, it is fixed to the Pori iodine in the PVA resin film F by which the dyeing drawing was carried out. The liquid presentation of this fixed tub 16 is usually 3 % of the weight of boric-acid concentration, and potassium iodide (KI) concentration 0.5. It is considering as weight %. And solution temperature is setting dipping time amount of a film as for about 40 seconds at 35 degrees C.

[0020] In the following rinse tank 18, actually, the fuel spray of about 20-degree C shower water is carried out to a film plane, and chemicals, such as a boric acid adhering to a film plane, are flushed. Moreover, in the drying furnace 20 of a final process, hot blast (about 90 degrees C) is sprayed on a film plane. The blasting time amount of hot blast is for about 70 seconds. Thickness of a PVA resin film is set to about 20-35 micrometers in the condition of having passed through this desiccation process.

[0021] Next, since various kinds of trials were performed, the test result is explained. The following table 1 shows the test result under various kinds of conditions. As a test condition, six steps (0 %, 0.025%, 0.050%, 0.075%, 0.100%, 0.125 %) are adopted for the boric-acid concentration in the water solution of the swelling tub 10 in the range to 0% weight - 0.125 % weight. Moreover, three conditions (30 degrees C, 35 degrees C, 40 degrees C) were chosen in 30 degrees C - 40 degrees C, and, as for solution temperature, the dipping time amount of a film has also chosen three conditions (4 minutes, 5 minutes, 6 minutes) in the range for 4 minutes - 6 minutes further.

[0022] and -- a table 1 -- one among these test conditions -- the conditions (dipping time amount 4 minutes, 30 degrees C of solution temperature) to which a degree of swelling becomes low most

2) The conditions to which a degree of swelling becomes high most (dipping time amount 6 minutes, 40 degrees C of solution temperature)

3) The conditions which take the lead in the condition range (dipping time amount 5 minutes, 35 degrees C of solution temperature)

The result performed by coming out is shown.

[0023]

[A table 1]

条 件			特 性			
浸せき時間 (min)	温度 (℃)	ホルム酸濃度 (%)	偏光度 σ (%)	単体透過率 σ (%)	光学特性	走行性
4	30	0	0.004	0.503	×	×
		0.025	0.003	0.486	×	$\Delta \sim O$
		0.050	0.003	0.112	O	O
		0.075	0.003	0.130	O	O
		0.100	0.005	0.073	O	O
		0.125	0.003	0.095	× (染色不足)	O
5	35	0	0.003	0.669	×	×
		0.025	0.003	0.489	×	Δ
		0.050	0.004	0.157	Δ	O
		0.075	0.003	0.138	O	O
		0.100	0.003	0.095	O	O
		0.125	0.005	0.092	× (染色不足)	O
6	40	0	0.006	0.898	×	×
		0.025	0.004	0.571	×	×
		0.050	0.003	0.179	Δ	Δ
		0.075	0.004	0.146	O	O
		0.100	0.002	0.092	O	O
		0.125	0.003	0.108	× (染色不足)	O

[0024] As a characteristic test of a film, each item of degree of polarization, simple substance permeability, an optical property, and the performance traverse in a production line was mentioned, and characterization was performed by optical measurement or inspection by viewing about these items.

[0025] Performing measurement of the basic optical property of a polarization film by the polarizing prism method in it, the measuring instrument used "MCPD-1000 28C" of an Otsuka electronic company. As a measurement parameter, the parallel permeability K1 with prism (%) and the rectangular permeability K2 with prism (%) were measured in the spectrum with a wavelength property of 380nm - 800nm, and degree of polarization V and the simple substance permeability Y were computed by the following several 1, respectively.

[0026]

[Equation 1]

$$\text{偏光度 } V = \frac{K_1 - K_2}{K_1 + K_2} \times 100 [\%]$$

$$\text{単体透過率 } Y = \frac{K_1 + K_2}{2} [\%]$$

[0027] Degree of polarization V and the simple substance permeability Y thought that it was hard to carry out a relative comparison since a value is changed for every manufacture conditions, and standard deviation sigma was merely shown in a table 1, respectively. It measures for every progress for 1 minute in [monograph affair] 30 minutes during line transit, and standard deviation sigma is computed and shown from a total of 31 times (N= 31) of measured value.

[0028] And as assessment of an optical property, since there was no significant difference in each sample so much about degree of polarization V, the value and dyeing degree of simple substance permeability sigma (%) performed characterization. Among a table 1, a part of fitness and "*** mark of "O mark"" are problematic, and "x mark" is assessment of a defect. In this case, I hear that the variation in the optical property of the direction of a production line is so large that the value of sigma is large, and assessment of simple substance transmission sigma (%) is sigma<0.150. It is fitness (O mark) and 0.150<=sigma<0.200 ** mark and sigma>=0.200 It judged with the defect (x mark).

[0029] Moreover, the generating condition of Siwa on the front face of a film performed assessment of line performance traverse, and that in which fitness (O mark) is conspicuous in a thing without Siwa, and ** mark and generating of Siwa are conspicuous in what generating of Siwa is accepted a little in was judged to be a defect (x mark). A certain amount of functionality is accepted between the variation in an optical property, and the generating condition of Siwa.

[0030] a deer -- carrying out -- the test result of a table 1 -- seeing -- introduction and 1 -- the characterization of conditions (dipping time amount 4 minutes, 30 degrees C of solution temperature) by which a degree of swelling becomes low most -- the boric-acid concentration of a swelling tub -- 0% and 0.025% In extent, variation is in an optical property and the result that a problem has slight line performance traverse (Siwa generating) was obtained. And boric-acid concentration is 0.050%, 0.075%, and 0.100%. There is also no variation in an optical property then, and the result that line performance traverse (Siwa generating) was also good was obtained. 0.125% of however, boric-acid concentration Poor dyeing of a film was accepted in the case. Therefore, the judgment that the optimal range of the boric-acid concentration of a swelling tub was 0.05 - 0.10 % of the weight was obtained.

[0031] 2 [next,] -- the characterization of the conditions (dipping time amount 6 minutes, 40 degrees C of solution temperature) to which a degree of swelling becomes high most -- seeing -- above-mentioned 1 -- assessment hardly changes with the case where they are the conditions (dipping time amount 4 minutes, 30 degrees C of solution temperature) to which a degree of swelling becomes low most. Although the variation of an optical property and Siwa generating by line transit were accepted when boric-acid concentration was 0.050 % a little, this regards it as error range. Therefore, also when it was the conditions to which this degree of swelling becomes the highest, assessment with fitness was obtained in the range whose boric-acid concentration of a swelling tub is 0.05 - 0.10 % of the weight.

[0032] furthermore, the characterization of the conditions (dipping time amount 5 minutes, 35 degrees C of solution temperature) which take the lead in 3 condition range -- above-mentioned 1 -- the conditions (dipping time amount 4 minutes, 30 degrees C of solution temperature) to which a degree of swelling

becomes low most, and 2 -- it was the assessment which hardly changes to the case where they are the conditions (dipping time amount 5 minutes, 35 degrees C of solution temperature) to which a degree of swelling becomes high most. The proper range of the boric-acid concentration of a swelling tub is 0.05-0.10. It is weight %.

[0033] It was checked that there is also no Siwa generating of a film plane and good line performance traverse is obtained while the variation (sigma) in the simple substance transmission of a polarization film is controlled and the improvement of an optical property is accepted by blending a boric acid with a swelling tub by this example summarizing the above test result. And as proper range of the boric-acid concentration, 0.05 - 0.10 % of the weight is desirable, and it is 0.10. When weight % was exceeded, it was also checked that cause poor dyeing conversely and an optical property is spoiled.

[0034] Although the example was explained in full detail above, alterations various in the range which is not limited to the above-mentioned example at all, and does not deviate from the meaning of this invention are possible for this invention. For example, this invention may be applied, even if it adds a swelling assistant further to a swelling tub or the liquid presentation of a coloring tank, a fixed tub, etc. differs from this example. Moreover, of course, the base material of a polarization film is also applied also to the amelioration article or the other resin film raw material of a polyvinyl alcohol (PVA) resin film.

[0035]

[Effect of the Invention] A polarization film faces this invention being manufactured through the continuation production line which consists of a swelling process, an iodine dyeing process, a drawing process, a fixed process, a desiccation process, etc., it carries out impregnation of the boric-acid water of 0.05 - 0.10 % of the weight of boric-acid concentration to a polarization film base material in the swelling process before iodine dyeing, and it is made to make it swell.

[0036] Therefore, the degree of swelling of a polarization film base material is controlled, the variation in optical properties, such as polarizability, is canceled, generating of Siwa of a film base material front face is also lost in a production line again, and stabilization of quality is obtained. And quality control of a polarization film becomes easy by this, improvement in the product yield can also be aimed at, and it contributes also to cheap-ization of product cost.

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